DOCUMENT RESUME

ED 306 029 PS 017 962

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TITLE The Development of Organization in Children's Memory.
PUB DATE Apr 89
NOTE 14p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Kansas City, MO, April 27-30, 1989).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Age Differences; Classification; Cognitive Development; *Cognitive Structures; Difficulty Level; Elementary School Students; Elementary Secondary Education; Grade 2; Grade 6; Grade 10; High School Students; *Knowledge Level; Memory; *Recall (Psychology); *Word Lists

ABSTRACT

This study investigated the role of knowledge base organization in elementary school students' memory performance. In a preliminary study, students in grades 2, 6, and 10 rated words from three semantic categories for their category representativeness. Results disclosed age-related changes in how children rate words for high and low typicality. Based on the students' ratings, a 24-word list of words of high and low typicality was constructed for each grade level. These word lists subsequently were used in a multitrial free recall memory study. Within each of the three grades, 16 subjects studied and recalled grade 2 level words, 16 studied and recalled grade 6 level words, and 16 studied and recalled grade 10 level words. Analysis of variance was performed on recall scores, category clustering scores, and subjective organization scores. It was found that subjects in grades 6 and 10 organized age-appropriate word lists best. For less typical, but not highly typical words, recall and organization was best for the grade 2 words, followed by the grade 6 and grade 10 words. Findings also revealed that memory organization increased over trials only for the older subjects. The research indicates that age-appropriate word norms are important in investigations of children's memory development. However, the knowledge base accounts for only some age differences in memory organization and recall performance. (Author/RH)

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The Development of Organization in Children's Memory

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Presented at the biennial meeting of the Society for Research in Child Development, Kansas City, Missouri, April 1989.

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Abstract

It has been suggested that age differences in knowledge base development may be partially responsible for age differences in memory performance. The present research investigated the role that knowledge base organization plays in memory performance. In Experiment I, grade 2, 6, and 10 children rated words from three semantic categories for their category representativeness The results showed that there are age-related changes in how children rate words for high and low typicality. A 24-word list of high and low typical words was constructed for each grade level based on the ratings from Experiment I. These word lists were used in a multitrial free recall memory study in Experiment II. Within each grade (e.g., 2, 6, and 10), 16 subjects recalled grade 2 words, 16 subjects recalled grade 6 words, and 16 subjects recalled grade 10 words. It was found that grade 6 and 10 subjects organized age-appropriate word lists best. For low typical, but not high typical words, recall and organization was best for the grade 2 words, followed by the grade 6 and the grade 10 words. The findings also showed that memory organization increased over trials only for the older subjects. This research indicates that age-appropriate word norms are important when studying memory development in children. However, the knowledge base accounts for only some of the age differences in memory organization and recall performance.

It has recently been suggested that changes in knowledge base contribute to the development of organization in children's memory (e.g., Bjorklund, 1987; Chi, 1985). Associated with knowledge base developments are age-related increases in the agreement of the representativeness of category exemplars (e.g., Bjorklund, Thompson, & Ornstein, 1983). Children's recall and organization is better for items that they (as opposed to older children and adults) judge as typical or atypical category members (e.g., Bjorklund, 1987). It has been suggested that when memory is tested with age-appropriate materials (e.g., elaborated knowledge base for those age-appropriate items), children will show evidence of strategic functioning (e.g., Ornstein & Naus, 1985; Ornstein & Corsale, 1979). This occurs because well represented items in the knowledge base are easier to activate ostensibly leaving sufficient processing resources for storing other items or performing other cognitive operations such as memory strategies (Bjorklund, 1985, 1987).

The present research was designed to examine the development of the knowledge base by testing for age-related changes in the organization of memory as seen in free recall performance. If the knowledge base is an important factor in memory performance, children should perform best when tested with materials that reflect their current level of conceptual development. Thus, at each age level, it was predicted that recall and organization would be best for word norms of their own age group. It was hypothesized that more elaborated and differently organized knowledge bases of older children would allow them to recall not

only words from their same-age norms, but also from the norms of younger children. It has been suggested that this occurs through either older children's greater facility with the deliberate application of strategies or an increasing consistency in semantic categories such that relations are easily noticed and activated that spread of activation occurs (e.g., Bjorklund, Bernholtz, & Schwartz, 1985).

Finally, changes in organizational behavior were examined over multiple learning trials. This was because of recent evidence that there are age effects in the number of learning trials required for children to show organizational behavior (e.g., Bjorklund, 1988; Brainerd, Kingma, & Howe, 1986).

Experiment I

Method

Subjects. The subjects were 224 children (111 males, 113 females) from grades 2 (average age 7 years old), 6 (average age 11 years old), and 10 (average age 15 years old). There were 71 grade two subjects, 77 grade six subjects, and 76 grade ten subjects.

Procedure. Subjects in each grade were randomly assigned to rate words from three semantic categories (BIRDS, ANIMALS, BODY PARTS) for their category representativeness. For example, subjects were asked "Is a ROBIN a VERY GOOD, GOOD, POOR, or BAD example of a BIRD" or "Is a LION a VERY GOOD, GOOD, POOR, or BAD example of an ANIMAL"?

Results and Discussion

The major finding from this study was that children at different ages rated words differently when asked to judge how typical exemplars were of their category. From these ratings 24-word lists (8 words from each of the 3 categories) were constructed to represent the 4 highest and 4 lowest typical words from each category for each of the three grades. Inspection of these lists show that grade 2 norms are more likely to be unique (not considered the top four high or low typical words in any other word list) (15 of the 24) than grade 6 (8 of the 24) or grade 10 norms (9 of the 24). There were very few words (both high and low typical) common to all three grades but the number of common words increased with grade. This suggests that the judged representativeness of category members varies across age and that there is more consistency in ratings with age.

Experiment II

Method

Subjects. There were 144 subjects from grades 2, 6, and 10 (24 males and 24 females per grade).

Procedure. The procedure consisted of 4 study-distractor-free recall trials. Stimulus materials were 3 (1 from each grade) 24-word lists of high and low typical words based on the ratings from Experiment I. Subjects in each grade were randomly selected to study and recall either same grade or one of the two different grade word norm lists. Thus, within each grade, 16 subjects recalled grade 2 words, 16 subjects recalled grade 6 words, and 16 subjects recalled grade 10 words.

Results and Discussion

An analysis of variance was performed on recall scores, category clustering scores [Adjusted Ratio of Clustering, (ARC)], and subjective organization scores [Pair Frequency, (PF)]. As expected, the analysis of recall scores showed main effects of Grade [$F(2,72)=75.84$, $p<.01$] and Trials [$F(3,216)=205.51$, $p<.001$]. Recall was best for grade 10 subjects, then grade 6 and grade 2 subjects and recall increased across trials 1-4. There was also a main effect of Norms [$F(2,72)=5.13$, $p<.01$] which revealed that grade 10 norms were recalled best, followed by grade 6 and 2 norms. The older subjects showed significantly more organization (as measured by ARC) than the younger subjects. There were no other meaningful significant effects from this analysis.

According to the predictions, the younger children's norms should have been recalled better, overall, than the older children's. In order to ascertain why grade 10 word norms were recalled better than grade 2 norms, the Grade X Norms interaction ($p=.09$) was probed. The breakdown of this interaction into recall of high and low typical norms provides some support for the findings of Bjorklund and Thompson (1983).
For low typical words, grade 2 norms were recalled best, followed by grade 6 and 10 norms (an expected result according to Bjorklund & Thompson, 1983). For high typical words, grade 10 norms were recalled best, followed by grade 6 and 2 norms. This could be expected assuming that high typical words are incorporated into a child's semantic memory before low typical

words, which results in smaller differences between grades (e.g., Bjorklund, 1987).

Turning to the analysis of the PF scores, there was a significant Grade X Norms interaction, $F(4,72)=3.62$, $p<.01$. As shown in Figure 1, organization increased with age, regardless of list, and grade 10 subjects organized age-appropriate norms best, whereas grade 6 and 2 children showed no differences as a function of list ($p>.05$).

As shown in Figure 2, the Trials X Grade interaction [($F(4,144)=4.40$, $p<.01$] revealed that the mean organization (as measured by PF) for grade 2 and 6 subjects was lower than for grade 10 subjects. Organization for the grade 10 subjects increased substantially over trials but improvements were less marked for grade 2 and 6 subjects.

Conclusions

This research provided evidence that younger children and adults do not perceive the same words as typical or atypical category members. There are also quantitative differences in judged category membership between children and adults (Bjorklund & Thompson, 1983). Thus, when children are tested with adult defined category exemplars, age differences in knowledge base development are confounded with age differences in memory performance.

This research provided evidence that more than one processing trial facilitated the utilization of organizational strategies, but only for older children. By virtue of age and experience, older children have more featural links of greater

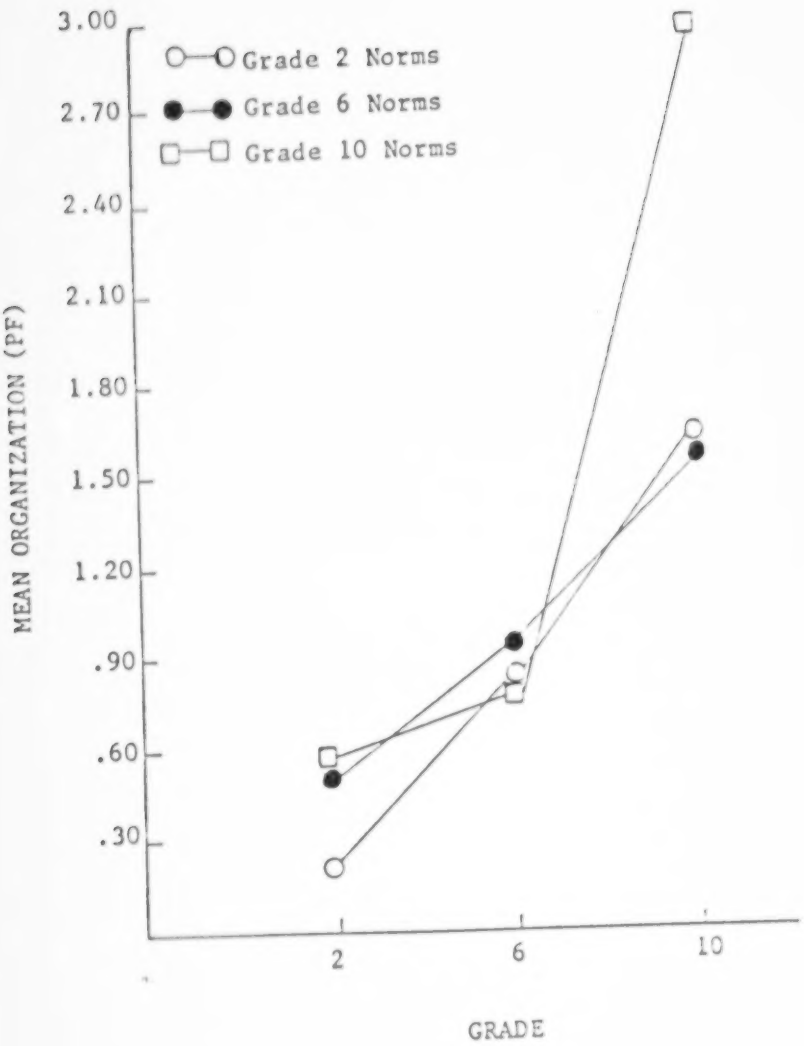

Figure 1. Mean Organization for Grade Two, Six and Ten Subjects for Three Sets of Word Norms

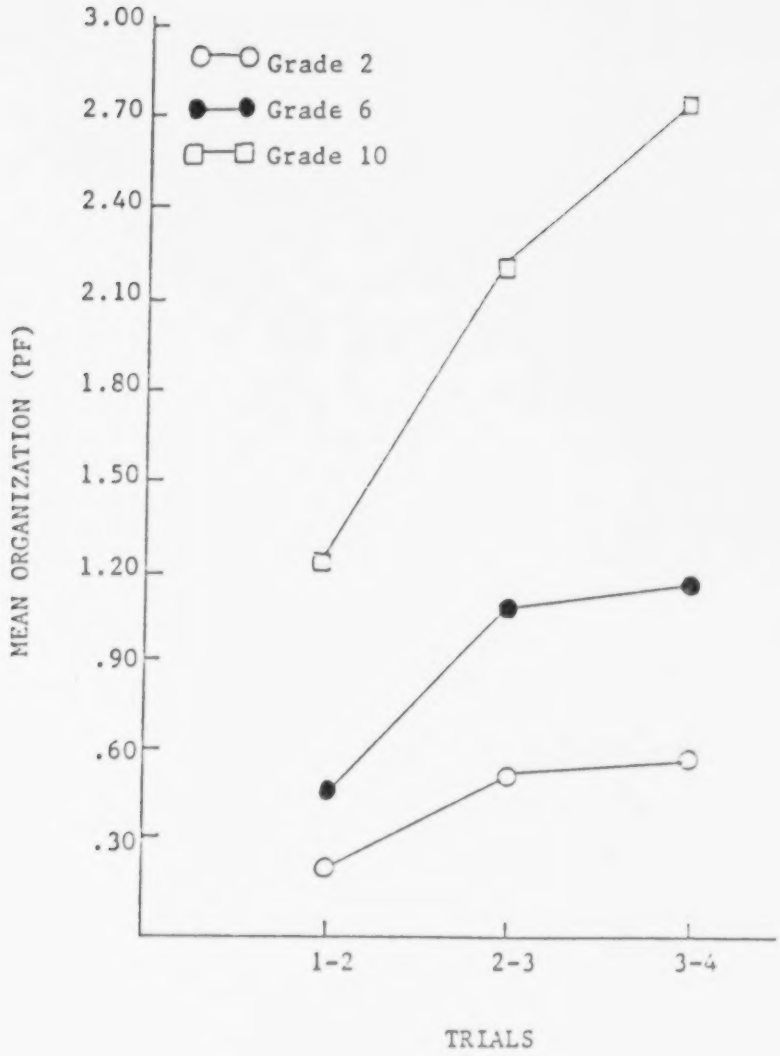

Figure 2. Mean Organization for Grade Two, Six and Ten Subjects Over Trials

strength. Spread of activation of these links accounts for increases in accessibility of knowledge. Category relations are noticed when well-established items in semantic memory are easily accessible, promoting strategic processing on subsequent trials (e.g., Bjorklund, 1987, 1988). However, this spread of activation has been thought not to occur prior to adolescence (e.g., Brainerd et al., 1986; Howe, Brainerd, & Kingma, 1985). It has been suggested that younger children are slower at activating items, which accounts for developmental differences in item accessibility (e.g., Bjorklund & Harnishfeger, 1987; Brainerd et al., 1986). There are constraints on younger children's processing such that multiple processing trials cannot be used to benefit performance to the same extent as older children.

The findings that younger children's organization does not increase across trials, even with age-appropriate materials, and that performance is still not high when children are tested with materials that reflect current organization in knowledge base, suggests that memory development involves a multitude of factors (other than knowledge base) that interact in a complex manner. Further research should consider the recent proposals that strategies and resources interact not only with the content, but also the structure (representation) of knowledge to influence memory performance (e.g., Bjorklund, 1987; Howe & O'Sullivan, in press; Rabinowitz & Chi, 1987).

References

Bjorklund, D.F. (1985). The role of conceptual knowledge in the development of organization in children's memory. In C.J. Brainerd & M. Pressley (Eds.), Basic Processes in Memory Development: Progress in Cognitive Developmental Research. New York: Springer-Verlag.

Bjorklund, D.F. (1987). How age changes in knowledge base contribute to the development of children's memory: An interpretive review. Developmental Review, 7, 93-130.

Bjorklund, D.F. (1988). Acquiring a mnemonic: Age and category knowledge effects. Journal of Experimental Child Psychology, 45, 71-87.

Bjorklund, D.F., Bernholtz, J.E., & Schwartz, R.J. (1985, April). The role of knowledge in the memory performance of good and poor readers. Unpublished paper presented at SRCD, Toronto.

Bjorklund, D.F., & Harnishfeger, K.K. (1987). Developmental differences in the mental effort requirements for the use of an organizational strategy in free recall. Journal of Experimental Child Psychology, 44, 109-125.

Bjorklund, D.F., & Thompson, B.E. (1983). Category typicality effects in children's memory performance: Qualitative and quantitative differences in the processing of category information. Journal of Experimental Child Psychology, 35, 329-344.

Bjorklund, D.F., Thompson, B.E., & Ornstein, P.A. (1983). Developmental trends in children's typicality judgments. Behavior Research Methods & Instrumentation, 15, 350-356.

Brainerd, C.J., Kingma, J., & Howe, M.L. (1986). Spread of encoding and the development of organization in memory. Canadian Journal of Psychology, 40, 203-223.

Chi, M.T.H. (1985). Changing conception of sources of memory development. Human Development, 28, 50-56.

Howe, M.L., Brainerd, C.J., & Kingma, J. (1985). Development of organization in recall: A stages-of-learning analysis. Journal of Experimental Child Psychology, 39, 230-251.

Howe, M.L., & O'Sullivan, J.T. (in press). The development of strategic memory: Coordinating knowledge, metamemory, and resources. In D.F. Bjorklund (Ed.), Children's Strategies: Contemporary Views of Cognitive Development. Hillsdale, N.J.: Erlbaum.

Ornstein, P.A., & Corsale, K. (1979). Organizational factors in children's memory. In C.R. Puff (Ed.), Memory Organization and Structure (pp. 219-257). New York: Academic Press.

Ornstein, P.A., & Naus, M.J. (1985). Effects of the knowledge base on children's memory strategies. In H.W. Rees (Ed.), Advances in Child Development and Behavior (vol. 19, pp. 113-148). New York: Academic Press.

Rabinowitz, M., & Chi, M.T.H. (1987). An interactive model of strategic processing. In S.J. Ceci (Ed.), Handbook of cognitive, social, and neuropsychological aspects of Learning disabilities (vol. 2, pp. 83-102). Hillsdale, N.J.: Erlbaum.